

Remarks

A. Pending Claims

Claims 342 and 460-494 are pending. Claims 342, 464-467, 479-482, 484, 486, 487, and 489-492 have been amended. Claims 464-467, 479-482, 484, 486, 487, and 489-492 have been amended for clarification or correction of typographical errors. Claims 493 and 494 are new.

B. The Claims Are Not Anticipated By Brennan Pursuant To 35 U.S.C. §102(b)

Claims 342, 462-466, 468-470, 476-479, 482-485, and 489-492 were rejected pursuant to 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,472,672 to Brennan (hereinafter “Brennan”). Applicant respectfully disagrees with these rejections.

The standard for “anticipation” is one of fairly strict identity. A claim can only be anticipated if each and every element set forth in the claims is found to be either expressly or inherently described in the cited art. *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 728, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987), MPEP § 2131.

Amended claim 342 describes a combination of features of a sensor array for detecting an analyte in a fluid including, but not limited to, the features of:

a particle positioned in at least one of the cavities, wherein the particle exhibits a spectroscopic change upon interaction with the analyte; and

one or more flexible projections positioned over a portion of the top of the cavity in which the particle is positioned, wherein one or more of the flexible projections are configured to substantially inhibit displacement of the particle from the cavity during use, and wherein one or more of the flexible projections are deformable during insertion of the particle into the cavity.

Support for the amendments is found in FIGS. 85A-D, and at least the following from Applicant's Specification:

In one embodiment, a receptor may be coupled to a polymeric resin. The receptor may undergo a chemical reaction in the presence of an analyte such that a signal is produced. Indicators may be coupled to the receptor or the polymeric bead. The chemical reaction of the analyte with the receptor may cause a change in the local microenvironment of the indicator to alter the spectroscopic properties of the indicator. The signal may be produced using a variety of signalling protocols. Such protocols may include absorbance, fluorescence resonance energy transfer, and/or fluorescence quenching. Receptor-analyte combinations may include, but are not limited to, peptides-proteases, polynucleotides-nucleases, and oligosaccharides- oligosaccharide cleaving agents.

In one embodiment, a receptor and an indicator may be coupled to a polymeric resin. The receptor may undergo a conformational change in the presence of an analyte such that a change in the local microenvironment of the indicator occurs. This change may alter the spectroscopic properties of the indicator. The interaction of the receptor with the indicator may be produce a variety of different signals depending on the signalling protocol used. Such protocols may include absorbance, fluorescence resonance energy transfer, and/or fluorescence quenching.

(Specification, page 9, line 28 through page 10, line 13)

An integrated cover layer of flexible projections 1340 formed in mask 1320 may provide a method of retaining particle 1350 in cavity 1330. In an embodiment shown in FIG. 85, flexible projections 1340 may be produced over cavity 1330. Mask opening 1310 may be smaller than the top of underlying cavity 1330. Particle 1350 may be inserted through flexible projections 1340 into cavity 1330 as depicted in FIG. 85. As particle 1350 passes flexible projections 1340, the flexible projections may elastically bend downward, as shown in FIG. 85B and FIG. 85C, until the particle passes completely by the flexible projections and into cavity 1330. As shown in FIG. 85D, after particle 1350 passes flexible projections 1340, the flexible projections may elastically return to their original position, thereby providing retention of the particle in cavity 1330. Retention of particle 1350 in cavity 1330 may be maintained by flexible projections 1348 during subsequent handling of the sensor array.

(Specification, page 187, lines 3-16, as amended in the Preliminary Amendment)

Brennan appears to teach a retaining device positioned at the bottom of a well. The retaining device appears to be dimensioned to substantially prevent passage of the solid support

through an orifice. Applicant submits the retaining device does not appear to be deformable to allow insertion of a particle during use. Brennan states:

A retaining device, generally designated 84, is included positioned in the bottom of well 26 between orifice 74 and the solid support 75 which is formed and dimensioned to substantially prevent passage of the solid support through the orifice. Retaining device 84 is preferably provided by a polyethylene or glass fiber frit which acts as a filter membrane permitting the reagent solution to flow therethrough while retaining the solid support and polymer chain grown thereon in the well. Hence, the porosity of the frit is also a factor in the formation of the capillary liquid seal and in the determination of the pressure differential necessary to purge the reaction well.

(Brennan, col. 10, lines 55-66)

Furthermore, www.merriam-webster.com defines “projection” as “a part that juts out”. Thus, Brennan does not appear to teach or suggest features of claim 342, including, but not limited to, the features of: “a particle positioned in at least one of the cavities, wherein the particle exhibits a spectroscopic change upon interaction with the analyte; and one or more flexible projections positioned over a portion of the top of the cavity in which the particle is positioned, wherein one or more of the flexible projections are configured to substantially inhibit displacement of the particle from the cavity during use, and wherein one or more of the flexible projections are deformable during insertion of the particle into the cavity”. Applicant respectfully requests removal of the rejection of claim 342.

Claim 462 describes a combination of features including, but not limited to: “wherein the cavity is configured to substantially contain the particle.” Brennan does not appear to teach or suggest at least the features of claim 462 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 462.

Claim 463 describes a combination of features including, but not limited to: “a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are removable.” Brennan does not appear to teach or suggest at least the

features of claim 463 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 463.

Claim 464 describes a combination of features including, but not limited to: “wherein the bottom of the cavity comprises an opening, and wherein the opening is configured such that the fluid flows through the cavity and out of the cavity through the opening during use.” Brennan does not appear to teach or suggest at least the features of claim 464 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 464.

Claim 465 describes a combination of features including, but not limited to: “further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the bottom layer is coupled to a bottom surface of the substrate and wherein the cover layer is removable, and wherein the cover layer comprises an opening and the bottom layer comprises an opening, and wherein the opening in the cover layer and the opening in the bottom layer are substantially aligned with the cavity during use.” Brennan does not appear to teach or suggest at least the features of claim 465 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 465.

Amended claim 466 describes a combination of features including, but not limited to: “further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer comprises an opening substantially aligned with the cavity, and wherein the bottom layer comprises an opening substantially aligned with the cavity.” Brennan does not appear to teach or suggest at least the features of claim 466 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 466.

Claim 468 describes a combination of features including, but not limited to: “wherein a width of a bottom portion of the cavity is substantially less than a width of a top portion of the cavity, and wherein the width of the bottom portion of the cavity is substantially less than a width

of the particle.” Brennan does not appear to teach or suggest at least the features of claim 468 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 468.

Amended claim 469 describes a combination of features including, but not limited to: “a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the bottom layer is configured to support the particle, and wherein the cover layer comprises an opening substantially aligned with the cavity.” Brennan does not appear to teach or suggest at least the features of claim 469 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 469.

Claim 470 describes a combination of features including, but not limited to: “further comprising a removable cover layer coupled to the substrate.” Brennan does not appear to teach or suggest at least the features of claim 470 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 470.

Claim 476 describes a combination of features including, but not limited to: “channels in the substrate, wherein the channels are configured to allow the fluid to flow through the channels into and away from the cavity.” Brennan does not appear to teach or suggest at least the features of claim 476 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 476.

Claim 477 describes a combination of features including, but not limited to: “a plurality of additional particles positioned within a plurality of additional cavities in the substrate.” Brennan does not appear to teach or suggest at least the features of claim 477 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 477.

Claim 478 describes a combination of features including, but not limited to: “a plurality of additional flexible projections positioned over a plurality of additional cavities in the

substrate.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of claim 478 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 478.

Amended claim 479 describes a combination of features including, but not limited to: “further comprising a cover layer coupled to the substrate, wherein at least one of the flexible projections is formed in the cover layer.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of claim 479 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 479.

Amended claim 482 describes a combination of features including, but not limited to: “wherein at least one of the flexible projections is configured to retain the particle in the cavity.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of claim 482 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 482.

Claim 483 describes a combination of features including, but not limited to: “wherein a top opening and a bottom opening of the cavity provides selection of the particle substantially contained in the cavity.” Brennan does not appear to teach that the top opening and the bottom opening of the cavity provide selection of the particle. Brennan appears to teach a well with a top opening that is larger than the bottom opening and addition of the controlled pored glass as a suspension. Brennan states, “a balanced density slurry technique is employed to deposit the correct amount of CPG into a reaction well” (Brennan, column 12, lines 26-28). Applicant respectfully requests removal of the rejection of claim 483.

Amended claim 484 describes a combination of features including, but not limited to: “wherein a size of the particle is smaller than a top opening of the cavity and larger than a bottom opening of the cavity such that the particle is substantially contained in the cavity.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of

claim 484 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 484.

Claim 485 describes a combination of features including, but not limited to: “wherein the particle is positioned within the cavity by using airflow to pull the particle through the flexible projection.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of claim 485 in combination with the features of independent claim 342.

Applicant respectfully requests removal of the rejection of claim 485.

Amended claim 489 describes a combination of features including, but not limited to: “wherein at least one of the flexible projections is configured to elastically bend into the cavity in the substrate.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of claim 489 in combination with the features of independent claim 342.

Applicant respectfully requests removal of the rejection of claim 489.

Amended claim 490 describes a combination of features including, but not limited to: “a mask configured to inhibit bending of at least one of the flexible projections from an initial position to a position away from the cavity.” For at least the reasons stated above, Applicant submits the features of claim 490 are not taught or suggested by Brennan. Applicant respectfully requests removal of the rejection of claim 489.

Amended claim 491 describes a combination of features including, but not limited to: “wherein at least one of the flexible projections is electrically actuated to allow insertion of the particle into the cavity.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of claim 491 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 491.

Amended claim 492 describes a combination of features including, but not limited to: “wherein at least one of the flexible projections is configured to elastically bend into the cavity in the substrate, and wherein the flexible projection is configured to be inhibited from bending away

from the cavity.” For at least the reasons stated above, Brennan does not appear to teach or suggest at least the features of claim 492 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 492.

C. The Claims Are Not Anticipated By Pfost et al. Pursuant To 35 U.S.C. §102(e)

Claims 342 and 461 were rejected pursuant to 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,485,690 to Pfost et al. (hereinafter “Pfost”). Applicant respectfully disagrees with these rejections.

Amended claim 342 describes a combination of features including, but not limited to, the feature of: “one or more flexible projections positioned over a portion of the top of the cavity in which the particle is positioned”.

Referring to FIG. 10, Pfost states, “Initially, the openings 20’ are sealed with sealing members 29. The sealing members have self-sealing openings which allow the entry of probes or pipettes in order to allow materials to be introduced into the chip member 10”” (Pfost, column 7, lines 61-64).

Pfost appears to teach sealing members that cover the entire openings. Pfost appears to teach sealing members that cover openings positioned over a channel rather than over a cavity in which a particle is positioned. Pfost does not appear to teach or suggest features of claim 342, including, but not limited to, the feature of: “one or more flexible projections positioned over a portion of the top of the cavity in which the particle is positioned”. Applicant respectfully requests removal of the rejection of claim 342.

Claim 461 describes a combination of features including, but not limited to: “wherein the particle has a size ranging from about 0.05 microns to about 500 microns in diameter.” Pfost does not appear to teach the size of the particle. Pfost appears to teach a size of wells and reservoirs. Pfost states, “The wells and reservoirs can vary more widely in size and shape and

can range in size from approximately 5-20,000 microns in width (preferably 500-12,000 microns) and from approximately 0–10,000 microns in height or depth (preferably - 0-6,000 microns)” (column 7, lines 42-46). Applicant respectfully requests removal of the rejection of claim 461.

D. The Claims Are Not Anticipated By Petersen et al. Pursuant To 35 U.S.C. §102(e)

Claims 342, 467, 471-475, 480, 481 and 486 were rejected pursuant to 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,682,649 to Petersen et al. (hereinafter “Petersen”). Applicant respectfully disagrees with these rejections.

Amended claim 342 describes a combination of features including, but not limited to, the features of: “one or more flexible projections positioned over a portion of the top of the cavity, wherein one or more of the flexible projections are configured to substantially inhibit displacement of the particle from the cavity during use”.

Referring to FIG. 2C, Petersen states:

...a second structure part 17 (FIG. 2C) is applied on top of any of the substrates with or without test confinements.... Such a second structure part can be made of, e.g., silicon in which case flow channels can be formed using standard photolithography and etching techniques. Such a second structure part can be applied on top of any of the embodiments.
(Petersen, column 11, lines 51-59)

Petersen appears to teach a structural cover for the whole substrate. Petersen does not appear to teach or suggest at least features of claim 342, including, but not limited to the features of: “one or more flexible projections positioned over a portion of the top of the cavity, wherein one or more of the flexible projections are configured to substantially inhibit displacement of the particle from the cavity during use”. Applicant respectfully requests removal of the rejection of claim 342.

Amended claim 467 describes a combination of features including, but not limited to: “wherein a minimum width of the cavity is less than a width of the particle.” As depicted in FIG.

4A, Petersen appears to teach a cell positioned in a cavity, wherein the minimum width of the cavity exceeds the width of the cell. Applicant respectfully requests removal of the rejection of claim 467.

Claim 471 describes a combination of features including, but not limited to: “wherein the substrate comprises a plastic material.” Petersen does not appear to teach or suggest at least the features of claim 471 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 471.

Claim 472 describes a combination of features including, but not limited to: “wherein the substrate comprises a silicon wafer.” Petersen does not appear to teach or suggest at least the features of claim 472 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 472.

Claim 473 describes a combination of features including, but not limited to: “the substrate comprises a dry film photoresist material.” Petersen does not appear to teach or suggest at least the features of claim 473 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 473.

Claim 474 describes a combination of features including, but not limited to: “wherein the substrate comprises a plurality of layers of a dry film photoresist material.” Petersen does not appear to teach or suggest at least the features of claim 474 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 474.

Claim 475 describes a combination of features including, but not limited to: “wherein an inner surface of the cavity is coated with a reflective material.” Petersen does not appear to teach or suggest at least the features of claim 475 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 475.

Amended claim 480 describes a combination of features including, but not limited to: “wherein at least one of the flexible projections comprises silicon nitride.” Petersen does not appear to teach or suggest at least the features of claim 480 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 480.

Amended claim 481 describes a combination of features including, but not limited to: “wherein at least one of the flexible projections comprises a plastic.” Petersen does not appear to teach or suggest at least the features of claim 481 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 481.

Amended claim 486 describes a combination of features including, but not limited to: “wherein at least one of the flexible projections comprises silicon dioxide.” Petersen does not appear to teach or suggest at least the features of claim 486 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 486.

E. The Claims Are Not Anticipated By Lavigne et al. Pursuant To 35 U.S.C. §102(b)

Claims 342, 460, 487, and 488 were rejected pursuant To 35 U.S.C. §102(b) as being anticipated by Lavigne et al. as described in “Solution-Based Analysis of Multiple Analytes by a Sensor Array: Toward the Development of an ‘Electric Tongue’”, J. American Chemical Society, vol. 120, pp. 6429-6430 (hereinafter “Lavigne”). Applicant respectfully disagrees with these rejections.

Amended claim 342 describes a combination of features including, but not limited to, the features of: “one or more flexible projections positioned over a portion of the top of the cavity, wherein one or more of the flexible projections are configured to substantially inhibit displacement of the particle from the cavity during use”.

Applicant’s Specification states:

In FIG. 82B a circular opening 1310 is formed in a mask 1320. When the exposed portion of the silicon substrate is etched using, e.g., a wet hydroxide etch, a pyramidal cavity 1330 is obtained. The circular opening 1310 defines the size of the cavity formed, but does not define the shape. The size of the cavity formed is complementary to the diameter of the circular opening. As depicted in FIG. 82B, the edge of the cavity extend[s] to the edge of the circle. It will be further noted, however, that the cavity still retains its pyramidal shape.

In some embodiments, a silicon-rich layer (e.g., silicon-rich silicon nitride) may be deposited on the substrate. The silicon-rich layer may provide a low stress layer advantageous for forming flexible projections. Flexible projections formed in a low stress layer may allow easier elastic bending of the flexible projections. Insertion of a particle through the flexible projections may also be substantially easier.

FIGS. 83 and 84 depict other shapes for openings that may be used to define the size, but not the shape, of a cavity that is formed in a silicon substrate. As can be seen in these examples, the size of the cavity is determined by the length and width of the openings. For example, in FIG. 83A, two slots are depicted. The width of the first slot and the width of the second slot control the size of the etching but, to some extent, allow a pyramidal cavity to be formed. Other shapes, as depicted in the other figures, may be used to form cavities. Generally, to form a cavity having a predefined shape, an opening, need only have a width and length that corresponds to the length and width of the desired cavity regardless of the shape of the opening.

In some embodiments, this feature of forming cavities using different shaped openings may be used to form cavities that include projections that extend over a portion of the upper surface of the cavity. FIGS. 83 and 84 show structures that may provide flexible projections over a formed cavity after the substrate is etched. In FIG. 83B a cross shaped opening may be formed over the substrate. The substrate may be subjected to an anisotropic etching to form a cavity in the substrate. Initially the cavity is formed in the regions of the substrate exposed through the opening. As etching continues, the cavity expands to regions below the mask, undercutting a portion of the mask. After a sufficient amount of time has passed the cavity may be as depicted in the last panel of FIG 83B. The cavity has a size that is complementary to the length and width of the opening. The cavity, however, has undercut a portion of the mask. The undercut portion of the mask forms projections 1340, which extend over a portion of the cavity. As will be discussed in more detail later, these projections may be used to help retain a particle within the cavity.

(Specification, page185, line 26 through page186, line 23)

Lavigne teaches micro-machined wells formed in Si/SiN wafers that confine the beads.

Lavigne states, “we positioned the resin beads within micro-machined wells formed in Si/SiN wafers, thus confining the beads to individually addressable positions on a multicomponent chip

(Figure 1B)" (page 6429, lines 2-4). Lavigne does not teach or suggest features of claim 342, including, but not limited to, the features of: "one or more flexible projections positioned over a portion of the top of the cavity, wherein one or more of the flexible projections are configured to substantially inhibit displacement of the particle from the cavity during use". Applicant respectfully requests removal of the rejection of claim 342.

Claim 460 describes a combination of features including, but not limited to: "wherein the particle comprises a receptor molecule coupled to a polymeric resin." Lavigne does not appear to teach or suggest at least the features of claim 460 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 460.

Amended Claim 487 describes a combination of features including, but not limited to: "wherein at least one of the flexible projections is transparent to light generated by a light source." Lavigne does not appear to teach or suggest at least the features of claim 487 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 487.

Claim 488 describes a combination of features including, but not limited to: "further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are transparent to light generated by a light source." Lavigne does not appear to teach or suggest at least the features of claim 488 in combination with the features of independent claim 342. Applicant respectfully requests removal of the rejection of claim 488.

F. Additional Remarks

Applicant believes the claims are in condition for allowance. Favorable reconsideration is respectfully requested.

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Appl. Ser. No.: 10/072,800
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Applicant believes no fees are due with the filing of this document. If an extension of time is required, Applicant hereby requests the appropriate extension of time. If any fees are required, please appropriately charge those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C., Deposit Account Number 50-1505/5936-00543/EBM.

Respectfully submitted,



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